

# TNO HVAC FACILITIES



HVAC laboratory overview

## TNO innovation for life

TNO has extensive knowledge of heating, ventilation and air conditioning (HVAC), and can offer its services through theoretical studies, laboratory experiments and field measurements. This complete scope, made possible through our test facilities, enables the effective development of new products, improvements to existing technology and performance measurement according to international or bespoke test standards.

Our HVAC laboratories are well equipped with the latest facilities for providing accurate and versatile measurements:

- Various environmental chambers to generate air-side operating conditions representing internal and external environments, including a large dual-room chamber. These rooms prove particularly useful in testing air conditioning, ventilation and heat pump equipment, with the versatility for bespoke testing of unusual concepts. Temperatures from  $-20^{\circ}\text{C}$  to  $45^{\circ}\text{C}$  are possible. The large chamber has a cooling capacity up to 28 kW.
- A Comfort Chamber housing two adjacent, environmentally controlled test rooms where external conditions (down to  $0^{\circ}\text{C}$ ) can be simulated. These represent a building section whereby comfort as well as equipment performance can be investigated.
- A small wind tunnel to measure the performance of ventilation components, such as diffusers.

- Facilities to generate water side conditions and conditioned air streams.
- Instrumentation and data acquisition systems.

Using such facilities in combination with the group's expertise, bespoke test rigs can be constructed for the testing of HVAC products and components, with the flexibility to meet almost any project requirement. Test rigs for air to air heat recovery, cooling systems, heat pumps, air curtains, humidification and dehumidification equipment have previously been constructed.

On-site measurement and longer term monitoring services are also offered. The combination of analytical and measurement services, both laboratory and in the field, provides a solid base to support our clients.



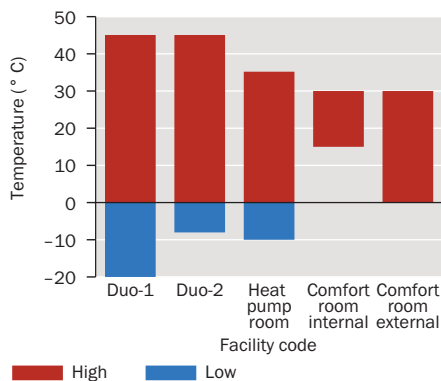
Dual-room chamber 1

#### EXAMPLE APPLICATIONS

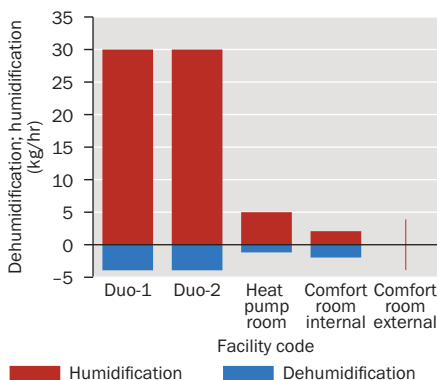
- Ventilation and heat recovery activities in accordance with NEN Standards and accredited to ISO/IEC 17025
- Accredited for NEN 5138; EN308; EN13141; Passiv Haus
- Accredited activities: thermodynamic measurements; air leakage; fan performance and verifying frost protection mechanisms
- Development of a method to determine the effectiveness of air curtains
- Dehumidification of commercial greenhouses
- Alternative adiabatic cooling and humidification
- Mobile indirect adiabatic cooling (for caravans and trucks)
- Legionella free humidification in air handling systems
- Developments in refrigeration and heat pumps
- Self-sufficient field hospitals

#### CLIMATE CHAMBERS SPECIFICATION (CONTACT US FOR OTHER REQUIREMENTS)

##### OPERATIONAL TEMPERATURE RANGE

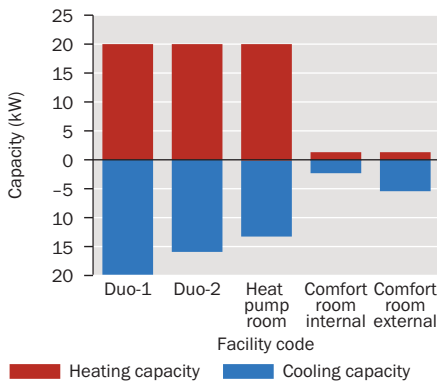


##### DEHUMIDIFICATION AND HUMIDIFICATION



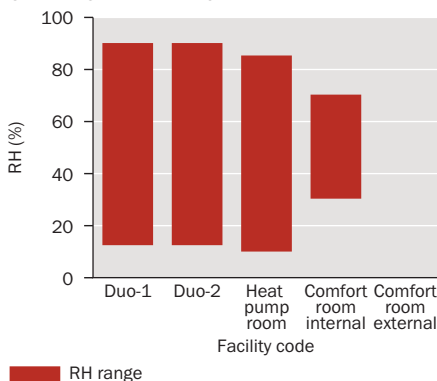
Dehumidification:  
Duo-1 and 2: 4 kg/hr at -3° C - 80% RH  
Duo-1 and 2: 12 kg/hr at 25° C - 40% RH

##### COOLING AND HEATING CAPACITY



Cooling capacity:  
Duo-1: 4 kW at -20° C  
Duo-1: 20 kW at -10° C  
Duo-2: 16 kW at -5° C

##### OPERATIONAL RH RANGE



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|                                      | Dimensions facilities                | Unit (mm)          |
|--------------------------------------|--------------------------------------|--------------------|
| <b>Dual-room chamber (each room)</b> | Internal (W × D × H)                 | 4795 × 7945 × 4000 |
|                                      | Door passage: sliding door (W × H)   | 3720 × 2600        |
|                                      | Removable intermediate panel (W × H) | 3585 × 4000        |
| <b>HP-room</b>                       | Internal (W × D × H)                 | 4300 × 3300 × 2700 |
|                                      | Door passage: sliding door (W × H)   | 1800 × 2500        |
| <b>Comfort room</b>                  | Internal Room A (W × D × H)          | 2700 × 3600 × 3000 |
|                                      | Internal Room B (W × D × H)          | 2700 × 3600 × 3000 |